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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA

ASHLEY M. GJOVIK, *an individual*, Plaintiff, vs. **APPLE INC.**, a corporation, Defendant.	**Case No. 3:23-CV-04597-EMC** **PLAINTIFF'S EXHIBIT**

MODELING TOXIC GAS RELEASES USING A SIMPLE SCREENING MODEL

by

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for
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1 February, 1987

This report was prepared in order to assist the Santa Clara County Fire Chief's Association in analysing the dispersion modeling requirement proposed in the Toxic Gas Model Ordinance.

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INTRODUCTION:

"On December 3, 1984 more than 2500 people were killed and 200,000 injured in Bhopal, India from the release of a highly reactive chemical intermediate gas, methyl isocyanate. Health and safety issues raised by this tragedy will be debated for years. The Bhopal event heightens our awareness of the danger to workers and the community from the release of noxious gases.

Toxic gases are among the most dangerous materials used in manufacturing semiconductor and related devices. The storage, handling, and disposal of these gases pose a major hazard to microelectronics workers and to communities near high-technology companies. Since the total quantity of toxic gases used in microelectronics companies is large and is increasing rapidly, it must be anticipated that accidents, acts of terrorism, or natural calamities will result in exposures." (1)

Shortly after the 1984 gas leak in Bhopal, the California State Legislature enacted Assembly Bill 1021 (Sher) which allocated $100,000 for the study and development of a Toxic Gas Model Ordinance and other regulations concerning the use and management of toxic gases.

The Fire Chief's Toxic Gas Model Ordinance Task Force has been meeting since April 1, 1986, to develop the model ordinance, and has a deadline of July 1,1987 for its completion.

The proposed ordinance could affect as many as 1,000 Santa Clara County businesses that store and use toxic gases (arsine, phosphine, chlorine, diborane, amonia, and silane, to name a few). In 1979 alone, the California Department of Industrial Relations reported that 42 surveyed semiconductor firms in Santa Clara County handled more than one and one-half million cubic feet of cylinder gases, including toxic arsine, phosphine and diborane. (2)

No community is adequately prepared to handle the major catastrophy that could result from the accidental rupture of a metal cylinder or pipe containing arsine gas, a highly toxic gas widely used by the semiconductor industry in Santa Clara County. An earthquake of a sizable magnitude could cause such a rupture in piping, and an accident in transportation or a fire could cause a major release of toxic gas.

Dr. Joseph LaDou, M.D., Acting Chief of the Division of Occupational and Environmental Medicine at U.C. San Francisco, reports that because arsine gas destroys red blood cells when it is inhaled, the only lifesaving procedure is a complete blood transfusion. The combined emergency rooms of all the hospitals in

most industrial communities could handle only a small number of such transfusions. It is clear that no community is prepared to respond to widespread exposure to arsine or other toxic gases.(2)

Phosphine is another highly toxic gas used in large quantities by the semiconductor industry. Dr. LaDou reports that the accidental release of the contents of a 20-pound cylinder of 100% phosphine gas would have to disperse over 1,792 acres, or 276 city blocks ten feet deep before being diluted to the permissible exposure level of 0.3 parts per million (ppm).

Acute exposure to phosphine results in death. Victims who survive will suffer liver and kidney damage which may be fatal. Heart and brain damage may also ensue. There is no known antidote to phosphine poisoning.

Currently there are no laws that either (1) regulate the maximum toxic gas concentrations to which communities may legally be exposed, or (2) regulate the scrubbing of toxic exhaust gases. Since a large number of semiconductor firms are located in close proximity to residential neighborhoods, the requirements of this Toxic Gas Model Ordinance will play a critical role in determining the degree of protection provided to the community. It will also provide protection to the workers who handle these toxic gases.

An important requirement in the first draft of the Toxic Gas Ordinance mandates that toxic gas users apply an air quality dispersion model to estimate the geographic areas that would be affected by a potential accidental release of toxic gases. If the model shows that an accidental release would create a toxic gas concentration at the property line in excess of a certain safety level (in this case the level is called Threshold Limit Value/TLV), the company would be required to notify the residents and conduct emergency response planning in the area of concern. The purpose of this study is to apply the EPA-approved air model to calculate the size of areas that could be affected by such accidental releases.

This paper reports the results of applying the EPA simulation screening model to the dispersion of four toxic gases commonly used in the semiconductor industry. The gases that are studied include arsine,phosphine, diborane and chlorine, which are four of the most commonly used toxic gases in the semiconductor industry in Santa Clara County. This industry was selected since it is the dominant toxic gas user in the county, and is the industry most responsible for the increased demand for these gases.

Since this study began, a second draft of the ordinance has been prepared. The second draft proposes a substantial weakening of the ordinance requirements for dispersion modeling. The dispersion modeling test is described in detail in the second draft, but it is only required under limited circumstances for existing exterior storage. Even this limited requirement may easily be

waived if simple valve protecion caps are in place. As such, the second draft has essentially no requirements for dispersion modeling tests. This may be an oversight. If not, it is certainly a significant back sliding from a very important part of this ordinance as will become obvious in this report.

It should also be noted that the second draft proposes to use a less stringent level of concern called the Community Emergency Level(CEL) rather than using the TLV proposed in the first draft. The TLV and the CEL levels are defined in the body of this report.

Whereas the CEL level of concern will result in smaller planning and evacuation areas than the original TLV level, the evacuation areas are still quite sizable. This report includes a comparison table showing the levels of concern proposed in the first and second drafts, and their resulting evacuation areas based on the EPA air pollution screening model. For instance, in many cases the evacuation radius for arsine is greater than 20 Kilometers (km) when the TLV level is assumed. This distance is reduced to about 5km (for 30 minute evacuation) or 10km (for 60 minute evacuation) when the CEL is substituted. In either case, the potential risks are enormous.

The EPA approved air pollution screening model is a very simple scheme to calculate gas or particle concentration down-wind of a pollution source. In regulatory decision making processes, these models are often a "first cut" to determine whether a problem might exist and a full scale investigation of a situation is recommended. If the results of the screening process indicate that a problem might exist, then a more sophisticated air quality simulation model can be applied to the situation in order to obtain more reliable results.

We used the screening model contained in the U.S. EPA "Chemical Emergency Preparedness Program" (EPA, 1985) and described in Appendix A of the Model Ordinance. This screening model is based on the EPA model INPUFF and is intended "as a screening tool to help the work group determine which sites in their community pose the greatest potential for causing death or irreversible injury should an accidental release of an acutely toxic chemical occur." (3)

We calculated the potential worst case down wind distances to which a gas would travel before being diluted to the various concentrations mentioned in the drafts of the Model Ordinance. We called these distances "dilution distances". The concentrations of concern are the Immediately Dangerous to Life and Health (IDLH), the Threshold Limit Value-Time Weighted Average (TLV-TWA), and the 30 minute and 60 minute Community Emergency Level (30-CEL and 60-CEL). These are called Levels of Concern. We assumed that the gases did not react chemically after release to the atmosphere.

Section 2 discusses the screening model and the methods of analy-

sis, Section 3 presents the results. Section 4 a summary of the study, and Section 5 the conclusions.

2. THE SCREENING MODEL AND METHODS OF CALCULATIONS

The screening model requires as input the Level of Concern (LOC) in grams per cubic meter and the weight of the stored source gases in pounds. The model as used in this exercise calculates the distance that the released gases would travel before being diluted to the Level of Concern. We called this distance the "dilution distance". This section discusses the methods of calculating the LOC and Source strengths. It also describes the screening model and the methods of calculating the dilution distances.

2.1 THE SCREENING MODEL

The screening model was based on the EPA model INPUFF (3). INPUFF is designed to model semi-instantaneous or continuous point sources over a spatially and temporally varying wind field. The screening model essentially summarizes the results of the INPUFF model for an assumed set of worst case meteorological conditions and reasonable source characteristics. "Model conditions were set to simulate a rupture or large spill from which a large cloud of material would be quickly generated." (3, appendix D)

The meteorological conditions are low wind speeds and limited mixing. Such meteorological conditions would be representative of a clear winter night in the bay area. The screening model assumes that gases are released from a point three feet above ground, that the gases are at ambient temperature and a one-minute duration release time. It does not calculate any chemical reactions after the gas is released.

2.2 CALCULATING THE LEVEL OF CONCERN

Calculating the Level of Concern (LOC) just converts the gas concentrations in parts per million (ppm) to the same concentration in gmm**3 and is given by $LOC = \frac{TL \times MW}{24500}$ (3, page D-3)

Where: LOC= Level of Concern (gmm**-3 or grams per cubic meter)

TL = Toxicity Level (ppm).

MW = Molecular Weight of Chemical.

The model ordinance mentions a number of possible LOC's: Immediately Dangerous to Life and Health (IDLH), Threshold Limit Value-Time Weighted Average (TLV-TWA), and three Community

Emergency Levels (CEL's). These three CEL's are the Threshold Limit Value-Short Term Exposure Limit (TLV-STEL), and concentrations for a 30-minute and a 60-minute evacuation time (30-CEL, and 60-CEL respectively).

The original ordinance defines these LOC's as follows:

Threshold Limit Value-Time Weighted Average (TLV-TWA):
As established by the American Conference of Governmental Industrial Hygenists (A.C.G.I.H.), this is the time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed day after day, without adverse effect. This concentrate is used as the trigger level for requiring a preplan or emergency response in order to address the exposure concerns associated with the general public due to acute accidental toxic gas release.

Immediately Dangerous to Life and Health (IDLH):
This is the concentration level which represents a maximum level from which one could escape within 30 minutes without any escape-impairing symptoms or any irreversible health effect.

Levels of Concern as discussed in the second draft of the ordinance:

COMMUNITY EMERGENCY LEVEL (CEL) is the maximum toxic gas concentration level for a single gas at which the community evacuation is recommended. The following values listed in the order of preference, shall be used for CEL's.

(a) Threshold Limit Value - Short Term Exposure Limit (TLV-STEL) as adopted by American conference of Governmental Industrial Hygienists.

This is the toxic gas concentraton to which workers can be exposed continuously for a short period of time without suffering from irritation, chronic or irreversible tissue damage, or narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue or materially reduce work efficiency as defined by The American Conference of Governmental Industrial Hygienists. A STEL is defined as a 15-minute time-weighted average exposure which should not be exceeded at any time during a work day, even if the eight-hour time-weighted average is within the TLV.

(b) If TLV-TWA is not available but TLV-TWA data exists, use four times TLV-TWA for 30-minute evacuation time and two times TLA-TWA for 60-minute evacuation time. Evacuation time for a facility shall be established by the Fire Chief. These limits are extrapolated by Zielhuis and the Dutch Committee on Public Emergency Limits (Ferguson, D.M.; Annuals of Occupational Hygiene; V.19, 275-84, 1976).

(c) If TLV-TWA and TLV-TWA are not available but inhalation

LC50 (1, 2 or 4 hours, single exposure) animal data exists, use 1% of the lowest number. For example, mouse 523 ppm/4H, rat 860 ppm/4H, use a value of 5ppm until further data becomes available.

2.3 Source Strengths

The information on gas quantities and concentrations came from the Hazardous Material Inventory Statements (HMIS) required by the Hazardous Materials Storage Ordinance (HMSO). The semiconductor industry was selected rather than a mixture of other industries because it is the dominant toxic user in the county, and is the industry most responsible for the increased demand for these toxic gases.

The HMIS information was given in quantity ranges as required by the HMSO. The quantity ranges used are shown in Table 1.

Table 1:

QUANTITY RANGE NUMBERS

UNITS	NO.1	NO.2	NO.3	NO.4	NO.5
cu.ft	<200	>200 but <2000	>2000 but <10000	>10000 but <20000	>20000

The Quantity Range Numbers (QRN) do not represent specific gas amounts, but rather quantity ranges. We therefore had to estimate the amount of gas available for release in an accident. We calculated the amount of gas which could be released in an accident (the source strength) using what we consider to be very conservative assumptions and called this the "Low Storage Case". The primary assumption was that only one cylinder of gas would rupture or otherwise cause an accidental release of gas. Cylinder sizes, gas properties and other commercial data were obtained from Matheson Gas Products Catalog 85. This section discusses the assumtions and methods used to calculate the source strengths.

We assumed that each quantity in QRN 1 was contained in the smallest cylinder for that gas and concentration. Pure and dilute mixtures of gases are listed in the catalog separately.

Pure arsine, phosphine, and diborane were assumed to be in lecture bottles, equivalent to Matheson 7X cylnders. Pure chlorine was assumed to be in a cylinder equivalent to a Matheson L. B. cylinder. The weights of arsine, phosphine and chlorine for these cylinders are listed in the catalog. Pure diborane is not listed in the catalog. We calculated the weight of diborane from the ratio of the specific volumes of arsine and diborane.

We assumed that dilute mixtures of arsine, phosphine, and diborane in QRN 1 occupied a nominal 30 cu.ft. at STP. The weights of arsine and phosphine were then calculated by dividing

the volume by the specific volume (cu.ft. per lb) as listed in the catalog and then multiplying by the concentration fraction. The weight of diborane was calculated from the ideal gas law.

The amount of gas in QRN 2 and higher was assumed to be in the smallest cylinder listed in the catalog with STP volume greater than 200 cu.ft. for that gas. Arsine, phosphine and diborane were assumed to be in a Matheson 1L or equivalent which contains a nominal 250 cu.ft. (If the Matheson 1A equivalent cylinder, which contains a nominal 200 cu.ft. at STP. were used it would probably be reported as QRN 1.) Chlorine was assumed to be contained in a Matheson 2 cylinder. The weights of arsine and phosphine were then calculated by dividing the volume by the specific volume and multiplying by the concentration fraction. Diborane weights were calculated from the ideal gas law.

Table 2 summarizes the quantities assumed for the low storage case.

(QUANTITY RANGE 1)	AMT IN LBS	IDHL	TWA	STEL	60-CEL	30-CEL
ARSINE	.06	<.03	.3	N/A	.2	.1
PHOSPHINE	.04	<.03	.1	.1	.2	.1
CHLORINE	1.	.03	.3	.2	.2	.1
DIBORANE	.012	<.03	.2	N/A	.1	.07

(QUANTITY RANGE 2&>)	AMT IN LBS	IDHL	TWA	STEL	60-CEL	30-CEL
ARSINE	16.0	.4	20.0	N/A	11.0	5.0
PHOSPH.	6.6	.2	5.	3.0	3.0	2.0
CHLOR.	40.0	.4	5.0	1.0	3.0	1.0
DIBORANE	3.6	.1	10.0	N/A	5.0	3.0

2.3 Method of Calculation

The screening model consists of a nomogram shown in Figure 1. Many source strength quantities and values of LOC were lower than the range provided on the scales in Figure 1. Since these scales were logrithmic, we simply extended them to encompass the necessary values. The resulting nomogram is shown in Figure 2. (Figure 2 has been reduced for publication. The nomogram we actually used is the same size as Figure 2.) We did not extend the distance scale since it is not logrithmic or any other simple

scale. Therefore distance greater than 20 km are just designated "greater than 20 km".

The method of using the nomogram is to draw a straight line between the source strength on the right hand scale and the LOC on the left hand scale. The required dilution distance is the intersection of that line with the middle scale.

3. RESULTS

This section discusses the results of applying the screening model described in Appendix A of the Final Draft of the Toxic Gas Model Ordinance. Dilution distances were calculated for each of the Levels of concern mentioned on the various drafts of the model ordinance.

Table 2 shows the dilution distances for releases of pure gas from the smallest cylinder in QRN 1 and QRN 2. For QRN 1 the IDHL dilution distance is smaller than the screening model can calculate. The dilution distances for the various proposed LOC's are all a few hundred meters. The IDLH dilution distances for QRN-2 and above, range from 100 meters to 400 meters. The dilution distances for the various proposed Levels of Concern range from 1 kilometer to over 20 kilometers.

The various LOC dilution distances were calculated for the quantities of arsine, phosphine, chlorine and diborane reported in the 1983-1985 Hazardous Materials Inventory Statements using methods and assumptions discussed above. These distances were calculated for 25 toxic gas facilities storing arsine (the distances at one site could not be calculated because gas concentrations were not reported.) Distances were calculated for 27 toxic gas facilities storing phosphine (five sites did not report gas concentrations). Distances were calculated for nine toxic gas facilities storing diborane and for 12 storing chlorine.

Table 2 shows the dilution distances calculated for each of the electronics toxic gas facilities storing one of the four gases studied. Some toxic gas facilities reported storing more than one quantity of a given gas; in those cases only the largest distance was reported. Table 3 summarizes the frequency distributions of the TLV-TWA dilution distances. The table shows that arsine, because of its high toxicity, results in the largest TLV-TWA dilution distances; eight facilities storing arsine show TLV-TWA dilution distances of 11 kilometers or greater. Nine arsine toxic gas facilities, 17 phosphine facilities, nine chlorine facilities and 3 diborane facilities show dilution distances between 1 kilometer and 10 kilometers. Twenty-seven facilities have dilution distances less than 1 kilometer.

Figures 3 through 5 show the areas which the screening model indicates would be in the "immediate community" of the toxic gas facilities that store arsine. Each map shows the boundaries of

the immediate community for a given Level of concern.

Table 3: FREQUENCY DISTRIBUTION OF TLV-TWA DILUTION DISTANCES

Distance (km)	Arsine	Phosphine	Chlorine	Diborane
<1	8	10	3	6
1-5	4	15	9	1
6-10	5	2	-	2
11-20	3	-	-	-
>20	5	-	-	-
Total	25	27	12	9

4. SUMMARY

The Chemical Emergency Preparedness screening model was used to calculate the immediate community as defined in the Toxic Gas Model Ordinance for the various Levels of Concern proposed in different drafts of the Toxic Gas Model Ordinance. The screening model is a very simple and conservative method of calculating gas concentrations down-wind of an accidental release from a toxic gas facility. Dilution distances were defined as the distance from the toxic gas facility to the boundary of the immediate community. These dilution distances were calculated for 36 toxic gas facilities in the Santa Clara Valley, each of which reported storing one or more of the gases arsine, phosphine, chlorine or diborane.

Since the Hazardous Materials Inventory Statements only report storage in Quantity Range numbers, we were forced to assume the number of pounds of gas available for release in each case. We assumed (1) that only one container would release gas in each case and that (2) that container was the smallest in the Quantity Range. In some cases a firm reported more than one quantity of gas; in such cases only the largest quantity was calculated. We also assumed that gases would not change chemically after release to the air.

Results are presented as tables of distributions of dilution distances for each gas and as maps showing the areas of the Santa Clara Valley that would be considered as in the immediate community of arsine toxic gas facilities. One map is included in the results section for each Level of Concern mentioned in the various drafts of the model ordinance.

5. CONCLUSIONS.

1. The screening model probably calculates the order of magnitude of the dilution distances. This conclusion comes from

the "rule of thumb" that this class of air pollution model calculates the pollution concentrations to within a factor of two and from the precision with which the scales of the model nomogram can be read.

2. The weather conditions assumed for the model represent those of a clear night with light winds. These conditions are fairly common in the Bay Area, especally in winter.

3. The Quantity Range Numbers of the Hazardous Materials Inventory are too broad for toxic gases. The wide range of quantities contained in each category require making assumptions concerning the amount of gas being stored. The Hazardous Materials Inventory reporting requirements should be ammended to include the reporting of the amount of gas contained in the largest cylinder on the premises, in addition to aggregate storage.

4. We think that the dilution distances shown in Figures 3-5 and Appendix B are conservative. The source amount of gas that could be released was assumed contained in the smallest cylinder listed for the Quantity Range Number reported in the Hazardous Materials Inventory sheets.

5. The calculated IDLH-dilution of lecture bottle quantities of pure gas is less than 30 meters. It is probably safe to say that this distance is less than 100 meters.

6. The calculated TVA-TWA-diluted distance of the bottle quantity of pure gas is on the order of tenths of a kilometer. It is probably safe to say that this distance is less than a kilometer.

7. The calculated IDLH-dilution distance of the largest cylinder of arsine listed is some tenths of a kilometer. It is probably safe to say that the IDLH-dilution distance is less than a kilometer. The phosphine IDLH-dilution distance is probably less than half a kilometer.

8. The calculated TLV-dilution distance of the largest cylinder of pure arsine listed in the catalog is greater than 20 km. This cylinder represents 15 lbs of gas. It is probably safe to say that this dilution distance is less that 25 km to 50 km.

9. Figures 3-5 and Appendix B show that virtually the entire Santa Clara Valley is the "immediate comunity" which in the event of a major release could be exposed to toxic gases concentrations in excess of the safe Level of Concern. If the final ordinance adopts the most protective TLV-TWA concentrations as the Level of concern then the affected area extends from roughly Santa Teresa Blvd. in San Jose in the South, to past Page Mill Rd. in Palo Alto in the North. If the least protective 30 minute evacuation time CEL is adopted, the southern limit of the potentially affected area moves to about Santa Clara Street-Alum Rock Ave. in San jose.

10. Section 310 (b)-3.A of the latest version of the Toxic Gas Model Ordinance states that, if engineering controls do not insure that gas releases are below the Community Emergency Level outside the property line then, "The immediate community shall be made aware of the hazards involved in a gas release from the toxic gas facility." This requirement will entail informing a very large number of people who live and work in the areas described abover.

6. REFERENCES

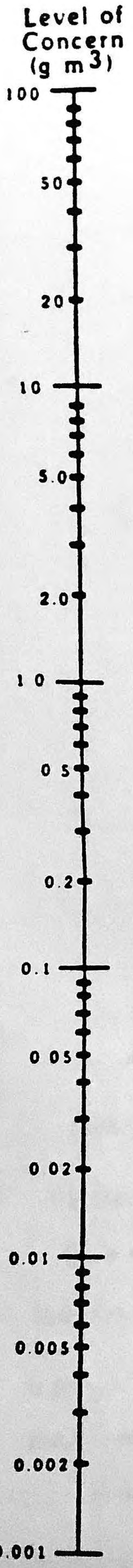
(1) "Toxic gases used in the microelectronics industry", by Peter Wald, M.D. and Charles Becker,M.D., The Microeoectronics Industry,Hanley & Belfus, Inc. 1986.

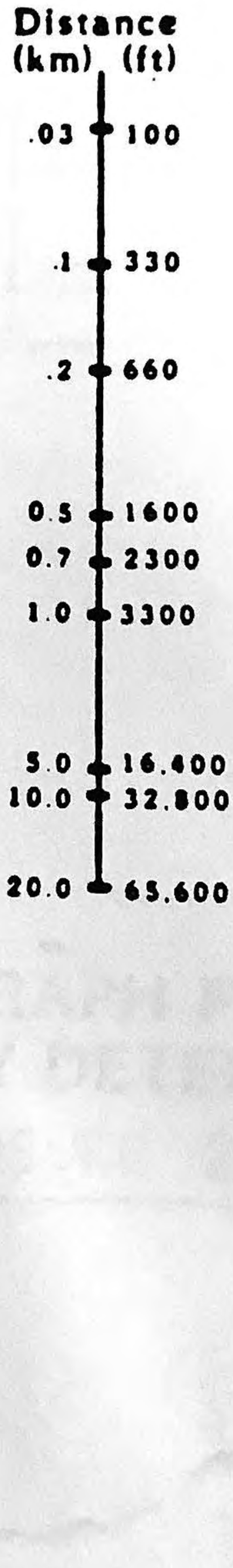
(2) "The Not-so-clean Business of Making Chips", by Joseph La Dou, M.D., "Technology Review" May-June 1984.

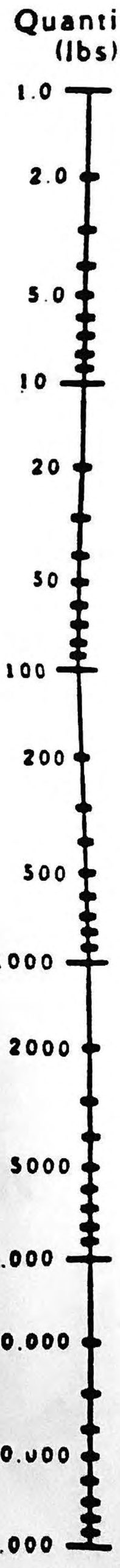
(3) EPA, 1985; Chemical Emergency Preparedness Program, Interim Guidance. Revision 1, USEPP, November 1985

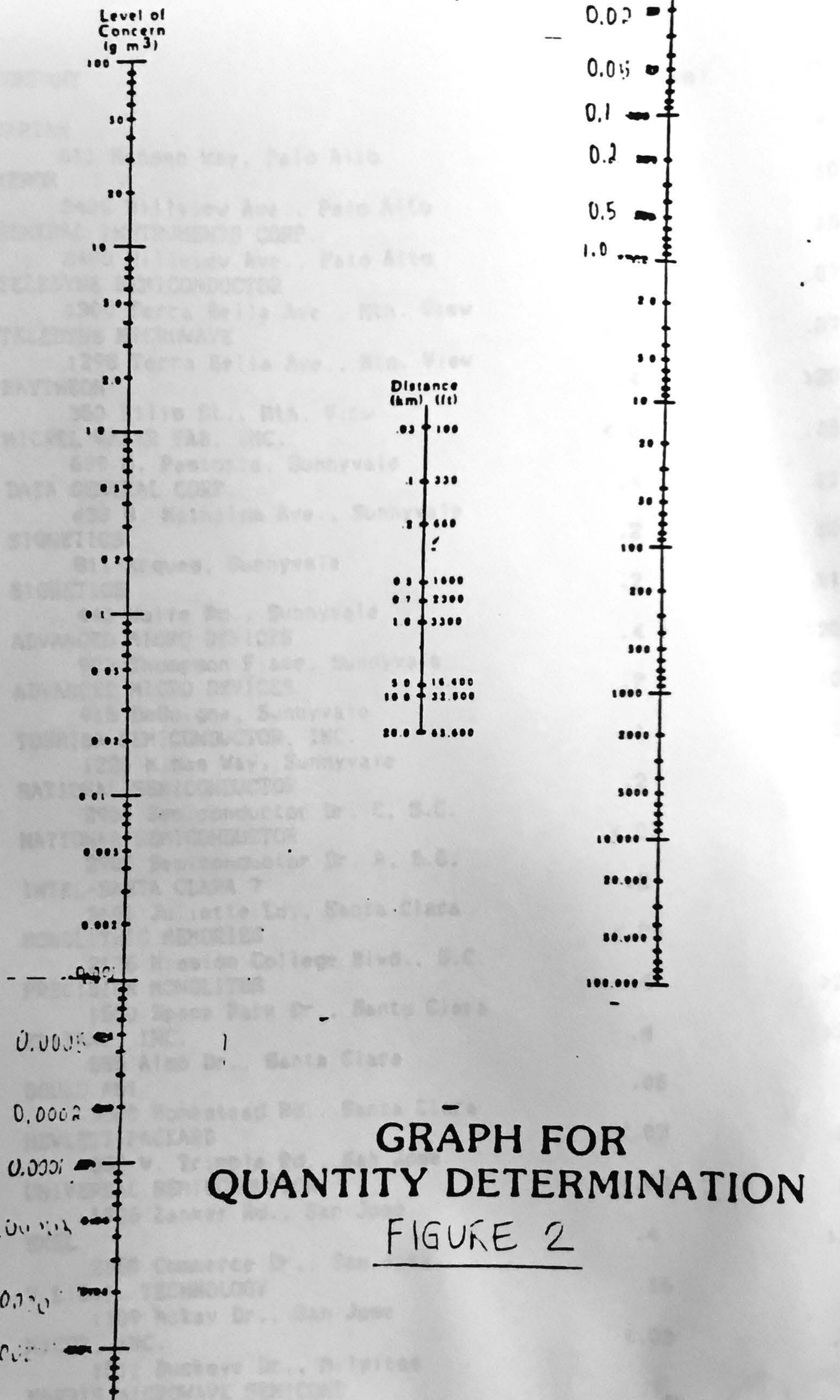
(4) Matheson Gas Products Catalogue, 1986

Figure 1
GRAPH FOR QUANTITY DETERMINATION









GRAPH FOR QUANTITY DETERMINATION

FIGURE 2

APPENDIX A

INDEX: ARSINE

SITE NUMBER	COMPANY	IDLH (km)	TLV (km)
1.	VARIAN 611 Hansen Way, Palo Alto	*	*
2.	XEROX 3406 Hillview Ave., Palo Alto	.2	10
3.	GENERAL INSTRUMENTS CORP. 3400 Hillview Ave., Palo Alto	.3	15
4.	TELEDYNE SEMICONDUCTOR 1300 Terra Bella Ave., Mtn. View	<.03	.07
4a.	TELEDYNE MICROWAVE 1298 Terra Bella Ave., Mtn. View	<.03	.07
6.	RAYTHEON 350 Ellis St., Mtn. View	.4	>20
9.	MICREL WAFER FAB, INC. 639 N. Pastoria, Sunnyvale	<.03	.35
11.	DATA GENERAL CORP. 433 N. Mathilda Ave., Sunnyvale	.4	11
12.	SIGNETICS 811 Arques, Sunnyvale	.2	10
13.	SIGNETICS 440 Wolfe Rd., Sunnyvale	.2	11
14.	ADVANCED MICRO DEVICES 902 Thompson Place, Sunnyvale	.4	>20
15.	ADVANCED MICRO DEVICES 915 DeGuigne, Sunnyvale	.2	10
16.	TOSHIBA SEMICONDUCTOR, INC. 1220 Midas Way, Sunnyvale	.1	3
17.	NATIONAL SEMICONDUCTOR 2900 Semiconductor Dr. C, S.C.	.2	10
18.	NATIONAL SEMICONDUCTOR 2900 Semiconductor Dr. A, S.C.	<.03	.1
19.	INTEL-SANTA CLARA 7 3601 Juliette Ln., Santa Clara	.2	10
20.	MONOLITHIC MEMORIES 2175 Mission College Blvd., S.C.	<.03	.1
23.	PRECISION MONOLITHS 1500 Space Park Dr., Santa Clara	.4	>20
24.	EPITAXY, INC. 555 Aldo Dr., Santa Clara	.4	>20
25.	GOULD AMI 3800 Homestead Rd., Santa Clara	.06	1
28.	HEWLETT-PACKARD 350 W. Trimble Rd., San Jose	<.03	.07
29.	UNIVERSAL SEMICONDUCTOR 1925 Zanker Rd., San Jose	<.03	.35
30.	EXEL 2150 Commerce Dr., San Jose	.4	>20
31.	V.L.S.I. TECHNOLOGY 1109 McKay Dr., San Jose	.16	5
34.	XICOR, INC. 1511 Buckeye Dr., Milpitas	<.03	.35
37.	HARRIS MICROWAVE SEMICOND. 1530 McCarthy Blvd, Milpitas	.1	3

*=Because concentration not specified, values could not be calculated.

INDEX: CHLORINE

SITE NUMBER	COMPANY	IDLH (km)	TLV (km)
6.	RAYTHEON 350 Ellis St., Mtn. View	.1	.7
7.	GTE COMM. PRODUCTS CORP. 100 Ferguson Dr., Mtn. View	.1	.7
8.	SUPERTEX 1225 Bordeaux Dr., Sunnyvale	.4	4
11.	DATA GENERAL CORP. 433 N. Mathilda Ave., Sunnyvale	.4	4
18.	NATIONAL SEMICONDUCTOR 2900 Semiconductor Dr. A, Santa Clara	.4	4
22a.	LSI LOGIC CORP. 3105 Alfred St., Santa Clara	.4	4
25.	GOULD AMI 3800 Homestead Rd., Santa Clara	.4	4
30.	EXEL 2150 Commerce Dr., San Jose	.4	4
31.	V.L.S.I. TECHNOLOGY 1109 McKay Dr., San Jose	.4	4
34.	XICOR, INC. 1511 Buckeye Dr., Milpitas	.1	.7
35.	FAIRCHILD-GATE ARRAYS 1801 McCarthy Blvd., Milpitas	.4	4
36.	HARRIS MICROWAVE SEMICOND. 1504 McCarthy Blvd., Milpitas	.4	4

INDEX: DIBORANE

SITE NUMBER	COMPANY	IDLH (km)	TLV (km)
4.	TELEDYNE 1300 Terra Bella Ave., Mtn. View	<.03	.15
5.	FAIRCHILD-LINEAR DIVISION 313 Fairchild Dr., Mtn. View	<.03	.04
8.	SUPERTEX, INC. 1225 Bordeaux Dr., Sunnyvale	<.03	.15
16.	TOSHIBA SEMICONDUCTOR, INC. 1220 Midas Way, Sunnyvale	<.03	.1
22.	MICRO POWER SYSTEMS, INC. 3100 Alfred St., Santa Clara	.2	10
25.	GOULD AMI 3800 Homestead Rd., Santa Clara	.1	4.5
29.	UNIVERSAL SEMICONDUCTOR 1925 Zanker Rd., San Jose	<.03	.15
31.	V.L.S.I. TECHNOLOGY 1109 McKay Dr., San Jose	.2	10
34.	XICOR, INC. 1511 Buckeye Dr., Milpitas	<.03	.3

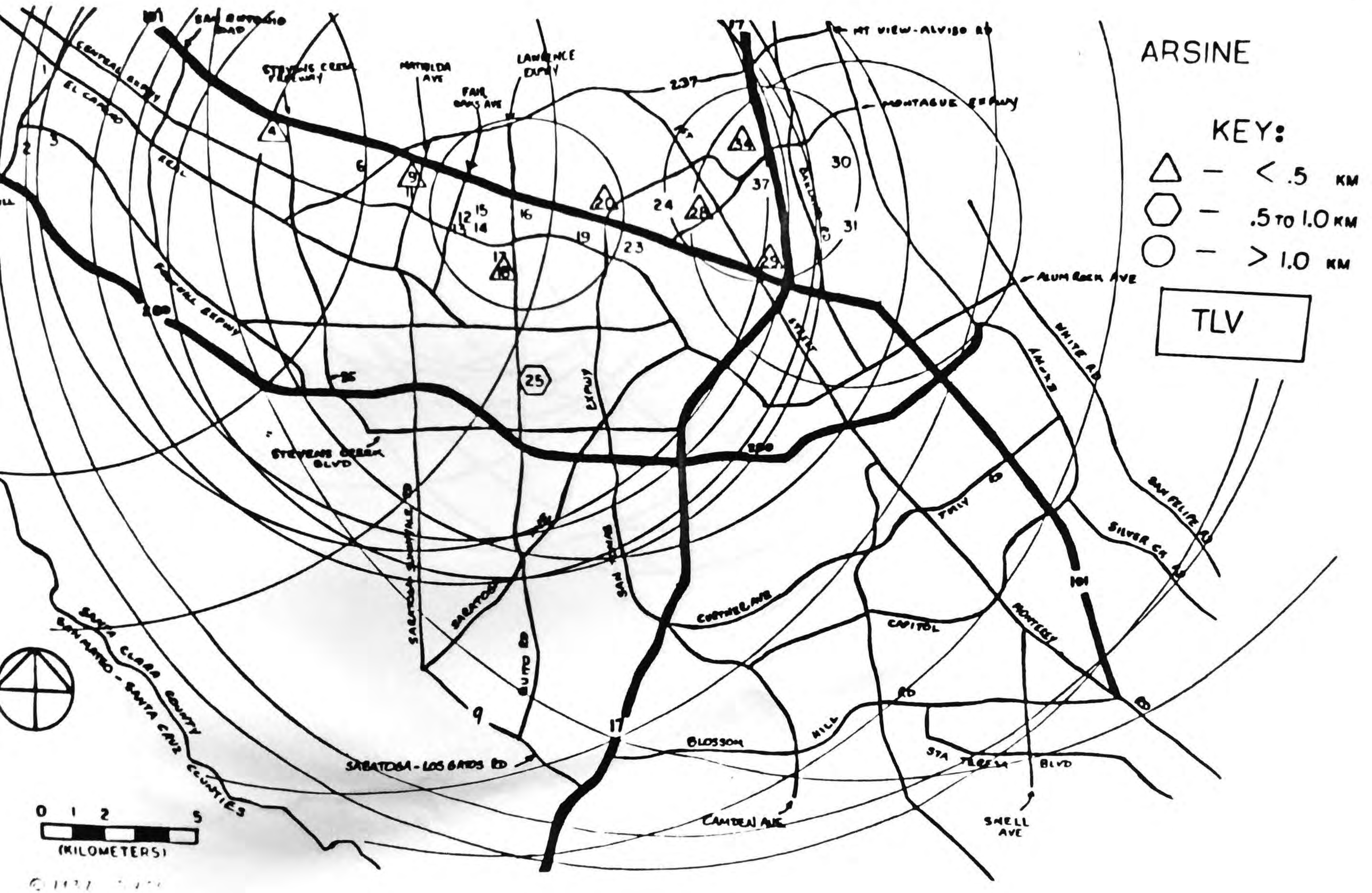
INDEX: PHOSPHINE

SITE NUMBER	COMPANY	IDLH (km)	TLV (km)
3.	GENERAL INSTRUMENTS CORP. 3400 Hillview Ave., Palo Alto	.05	4.5
4.	TELEDYNE SEMICONDUCTOR 1300 Terra Bella Ave., Mtn. View	<.03	.1
5.	FAIRCHILD-LINEAR DIVISION 313 Fairchild Dr., Mtn. View	<.03	.9
6.	RAYTHEON 350 Ellis St., Mtn. View	.05	4.5
8.	SUPERTEX 1225 Bordeaux Dr., Sunnyvale	.05	4.5
9.	MICREL WAFER FAB, INC. 639 N. Pastoria, Sunnyvale	*	*
10.	ZYMOS CORP. 477 N. Mathilda Ave., Sunnyvale	*	*
11.	DATA GENERAL CORP. 433 N. Mathilda Ave., Sunnyvale	.08	10
12.	SIGNETICS 811 Arques, Sunnyvale	.04	4
13.	SIGNETICS 440 Wolfe Rd., Sunnyvale	.04	4
14.	ADVANCED MICRO DEVICES 902 Thompson Pl., Sunnyvale	*	*
15.	ADVANCED MICRO DEVICES 915 DeGuigne, Sunnyvale	.05	4.5
16.	TOSHIBA SEMICONDUCTOR, INC. 1220 Midas Way, Sunnyvale	<.03	.9
17.	NATIONAL SEMICONDUCTOR 2900 Semiconductor Dr. C, Santa Clara	.03	3
18.	NATIONAL SEMICONDUCTOR 2900 Semiconductor Dr. A, Santa Clara	<.03	.4
19.	INTEL-SANTA CLARA 1 3065 Bowers Ave. #1, Santa Clara	<.03	.03
20.	INTEL-SANTA CLARA 7 3601 Juliette Ln., Santa Clara	.03	3
21.	MONOLITHIC MEMORIES 2175 Mission College Bl., Santa Clara	*	*
22a.	LSI LOGIC CORP. 3105 Alfred St., Santa Clara	.05	4.5
23.	PRECISION MONOLITHICS 1500 Space Park Dr., Santa Clara	.08	10
24.	EPITAXY, INC. 555 Aldo Ave., Santa Clara	.05	4.5
25.	GOULD AMI 3800 Homestead Rd., Santa Clara	<.03	.4
26.	INTERSIL, INC. 10900 N.Tantau Ave., Cupertino	.05	4.5
27.	INTL. MICRO ELECT. PRODUCTS 70 Dagget Dr., San Jose	<.03	.1
28.	HEWLETT-PACKARD 350 W. Trimble Rd., San Jose	<.03	.06
29.	UNIVERSAL SEMICONDUCTOR 1925 Zanker Rd., San Jose	<.03	.1

SITE NUMBER	COMPANY	IDLH (km)	TLV (km)
30.	EXEL 2150 Commerce Dr., San Jose	.05	4.5
31.	V.L.S.I. TECHNOLOGY 1109 McKay Dr., San Jose	.04	4
32.	TOPAZ 1971 N. Capitol Rd., San Jose	.05	4.5
33.	ACRIAN, INC. 490 Race St., San Jose	*	*
34.	XICOR, INC. 1511 Buckeye Dr., San Jose	.05	4.5
38.	LSI LOGIC CORP. 1601 McCarthy Blvd., San Jose	<.03	.1

*=Because concentration not specified, values could not be calculated.

[Note: Gas quantity and concentration info. from 1983-85 HMIS sheets.]


ARSINE
KEY:
△ — < .5 KM
⬡ — .5 TO 1.0 KM
○ — > 1.0 KM
TLV
MT VIEW-ALVISO RD
MONTAGUE EXPWY
ALUM ROCK AVE
WHITE RD
SAN FELIPE RD
SILVER CR RD
TULLY RD
MATILDA AVE
FAIR OAKS AVE
LAWRENCE EXPWY
237
EL CAMINO REAL
CENTRAL EXPWY
STEVENS CREEK BLVD
SARATOGA-SUNNYVALE RD
SARATOGA
BLOSSOM HILL
CAMDEN AVE
SHELL AVE
STA TERESA BLVD
CAPITOL
MONTEREY
COTTLE AVE
SARATOGA-LOS GATOS RD
SANTA CLARA COUNTY
SAN MATEO - SANTA CRUZ COUNTIES
0 1 2 5
(KILOMETERS)

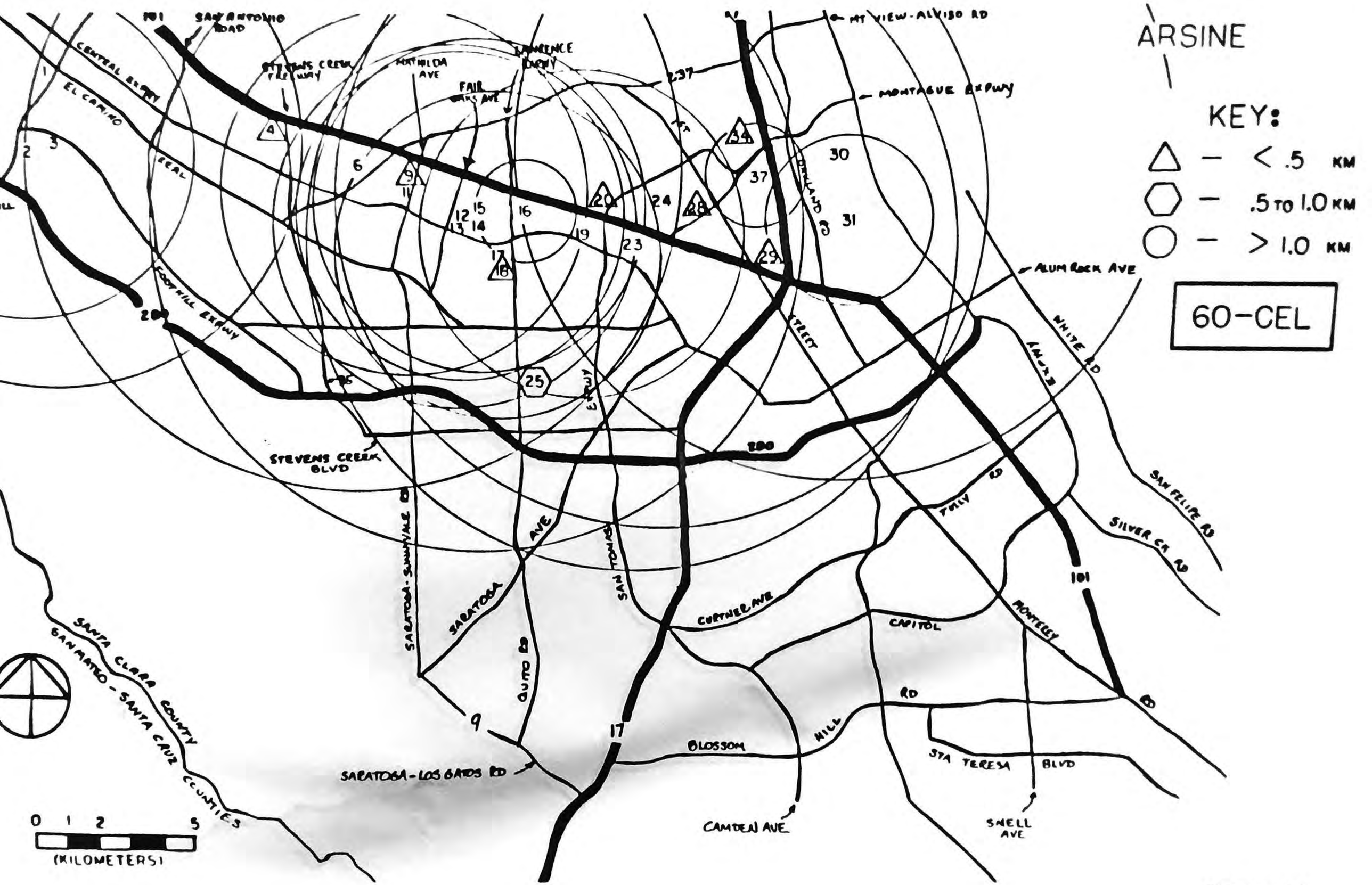

ARSINE
KEY:
△ — < .5 KM
⬡ — .5 TO 1.0 KM
○ — > 1.0 KM
60-CEL
101
SAN ANTONIO ROAD
CENTRAL EXPWY
EL CAMINO REAL
FOOTHILL EXPWY
STEVENS CREEK BLVD
MATHILDA AVE
FAIR OAKS AVE
LAWRENCE EXPWY
MT VIEW-ALVISO RD
MONTAGUE EXPWY
OAKLAND RD
ALUM ROCK AVE
WHITE RD
SAN FELIPE RD
SILVER CR RD
TULLY RD
STEVENS CREEK BLVD
SARATOGA-SUNNYVALE RD
SARATOGA AVE
DUNN RD
SAN TOMAS
CORNELIAN AVE
CAPITOL
MONTEREY
HILL RD
BLOSSOM HILL
STA TERESA BLVD
SARATOGA-LOS GATOS RD
CAMDEN AVE
SNELL AVE
SANTA CLARA COUNTY
SAN MATEO - SANTA CRUZ COUNTIES
0 1 2 5
(KILOMETERS)

FIGURE 4.2

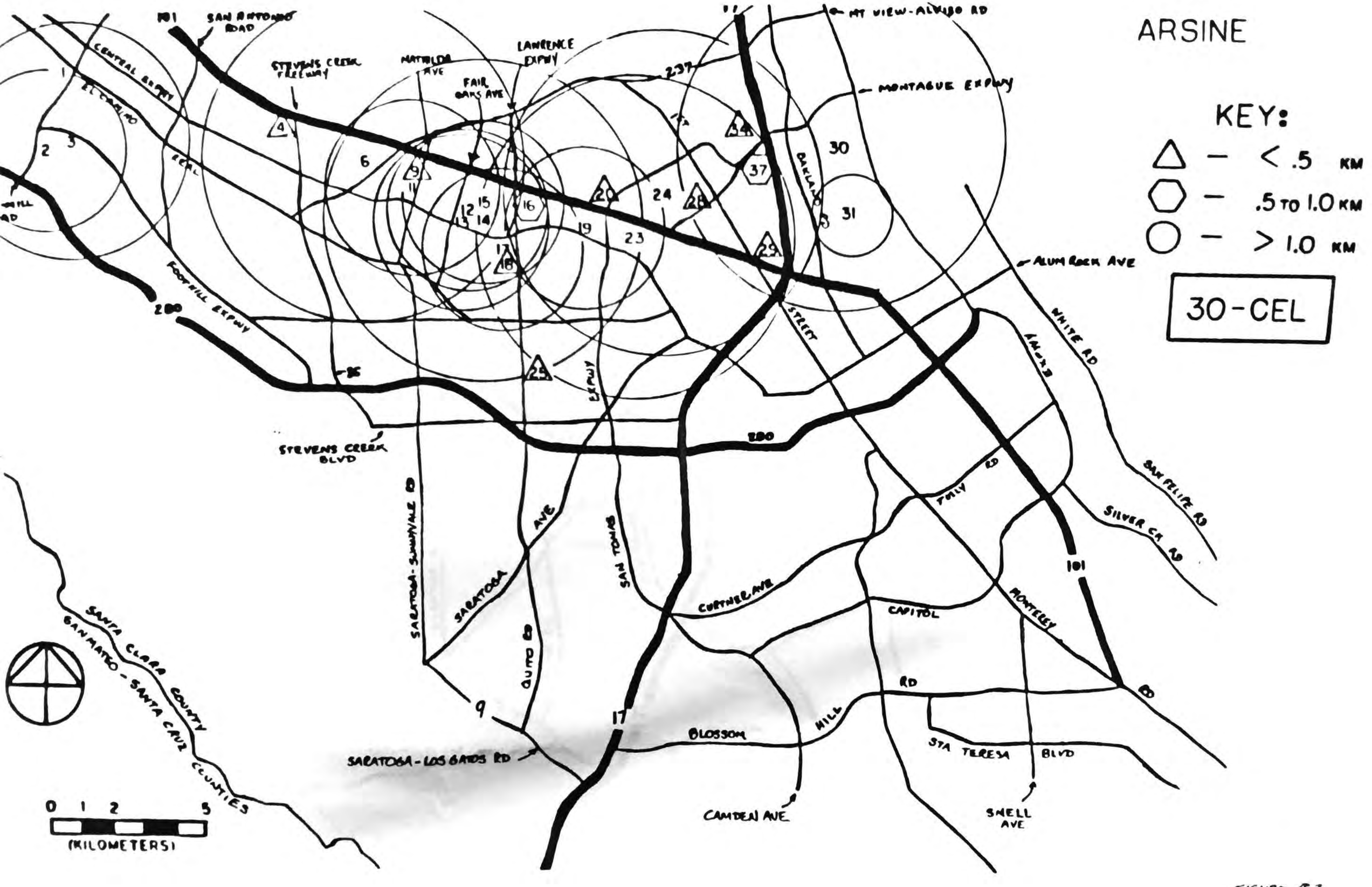
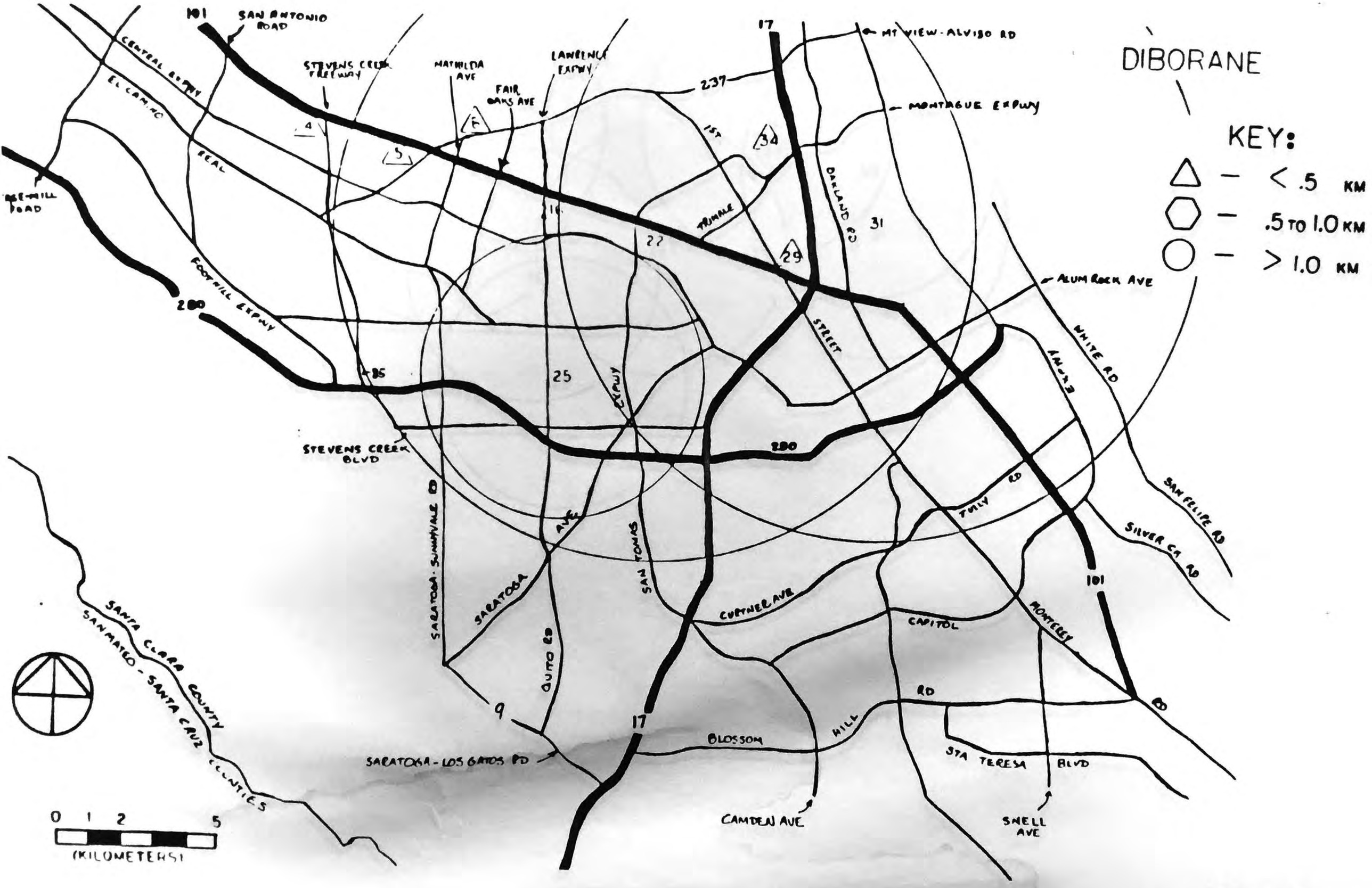
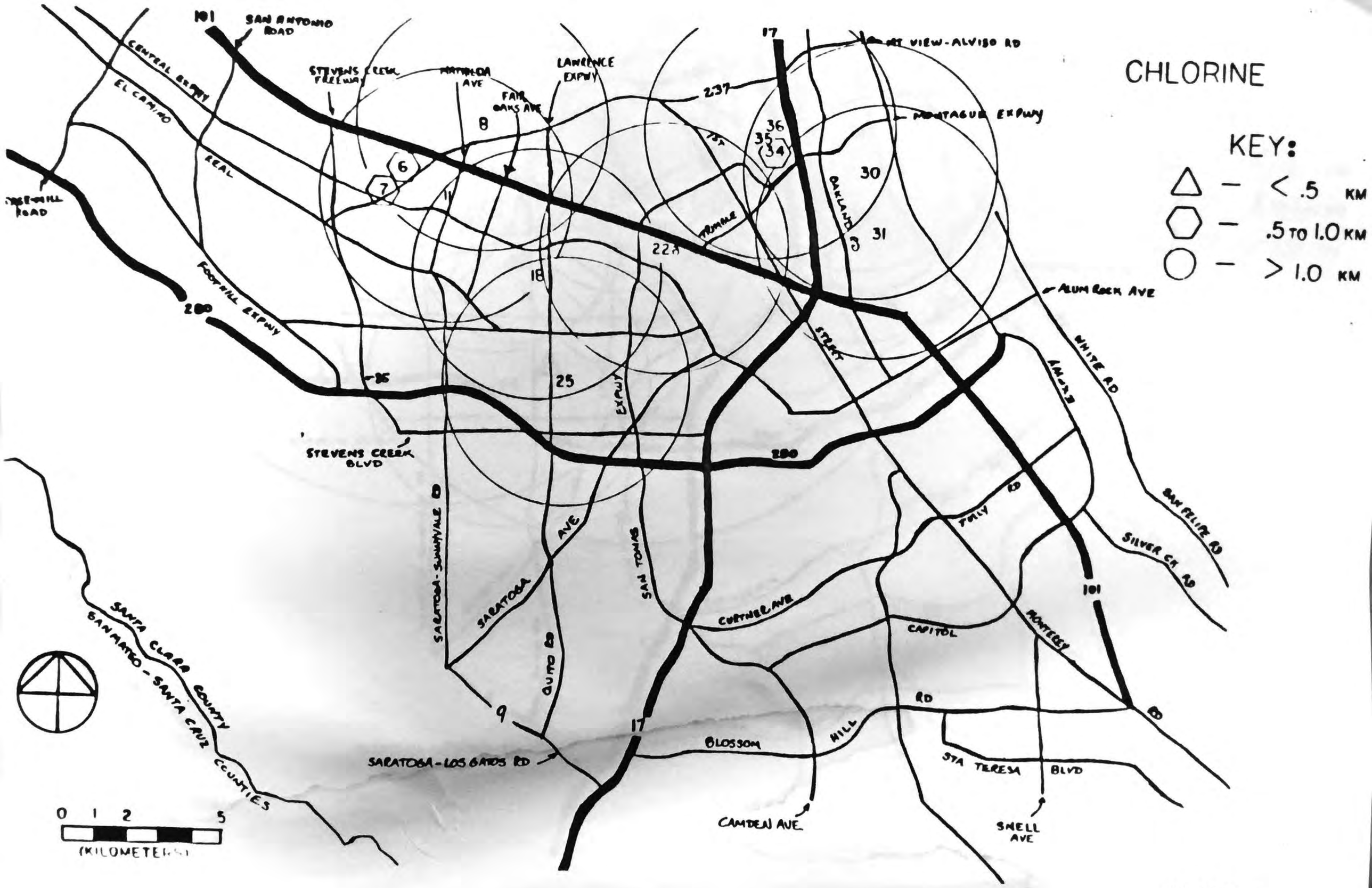

ARSINE
KEY:
△ — < .5 KM
⬡ — .5 TO 1.0 KM
○ — > 1.0 KM
30-CEL
MT VIEW-ALVISO RD
MONTAGUE EXPWY
ALUM ROCK AVE
WHITE RD
SAN FELIPE RD
SILVER CK RD
TULY RD
STEVENS CREEK BLVD
LAWRENCE EXPWY
STEVENS CREEK FREEWAY
MATHILDA AVE
FAIR OAKS AVE
CENTRAL EXPWY
EL CAMINO
FOOTHILL EXPWY
280
101
880
237
SARATOGA-SUNNYVALE RD
SARATOGA AVE
SAN TOMAS EXPWY
QUITO RD
SARATOGA
CAMPBELL AVE
CAPITOL EXPWY
MONTEREY RD
BLOSSOM HILL RD
STA TERESA BLVD
SARATOGA-LOS GATOS RD
CAMDEN AVE
SNELL AVE
SANTA CLARA COUNTY
SAN MATEO - SANTA CRUZ COUNTIES
0 1 2 5
(KILOMETERS)

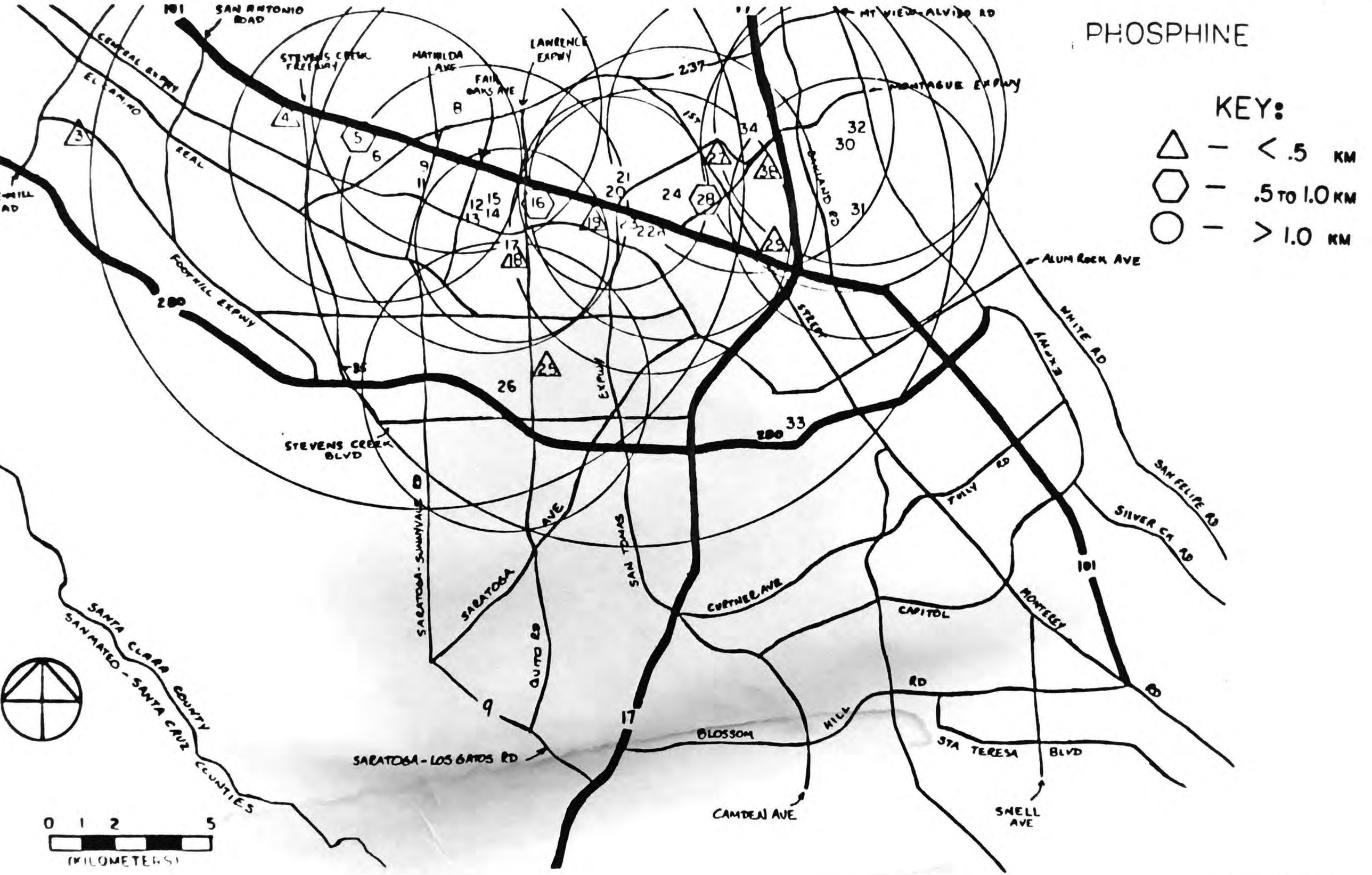
FIGURE 4.3


DIBORANE
KEY:
△ — < .5 KM
⬡ — .5 TO 1.0 KM
○ — > 1.0 KM
101
SAN ANTONIO ROAD
CENTRAL EXPWY
EL CAMINO REAL
FOOTHILL EXPWY
STEVENS CREEK FREEWAY
MATHILDA AVE
FAIR OAKS AVE
LAWRENCE EXPWY
237
MT VIEW-ALVISO RD
MONTAGUE EXPWY
ALUM ROCK AVE
DARLAND RD
TASMAN
1ST
WHITE RD
SAN FELIPE RD
SILVER CR RD
THLY RD
280
STEVENS CREEK BLVD
SARATOGA-SUNNYVALE RD
SARATOGA AVE
SAN TOMAS EXPWY
QUITO RD
CUPERTINO AVE
CAPITOL
MONTEREY
BLOSSOM HILL RD
STA TERESA BLVD
SARATOGA-LOS GATOS RD
CAMDEN AVE
SNELL AVE
SANTA CLARA COUNTY
SAN MATEO-SANTA CRUZ COUNTIES
0 1 2 5
(KILOMETERS)

APPENDIX B


CHLORINE
KEY:
△ — < .5 KM
⬡ — .5 TO 1.0 KM
○ — > 1.0 KM
101
SAN ANTONIO ROAD
CENTRAL EXPWY
EL CAMINO REAL
FOOTHILL ROAD
FOOTHILL EXPWY
280
STEVENS CREEK FREEWAY
PASTORIA AVE
FAIR OAKS AVE
LAWRENCE EXPWY
237
MOFFETT BLVD
MONTAGUE EXPWY
OAKLAND
TRIMBLE
ALUM ROCK AVE
WHITE RD
STEVENS CREEK BLVD
SARATOGA-SUNNYVALE RD
SARATOGA AVE
SAN TOMAS EXPWY
QUITO RD
CURTNER AVE
CAPITOL EXPWY
MONTEREY HWY
TULLY RD
SILVER CR RD
SAN FELIPE RD
BLOSSOM HILL RD
STA TERESA BLVD
SARATOGA-LOS GATOS RD
CAMDEN AVE
SNELL AVE
SANTA CLARA COUNTY
SAN MATEO - SANTA CRUZ COUNTIES
0 1 2 5
(KILOMETERS)

APPENDIX B


PHOSPHINE
KEY:
△ — < .5 KM
⬡ — .5 TO 1.0 KM
○ — > 1.0 KM
101
SAN ANTONIO ROAD
CENTRAL EXPWY
EL CAMINO REAL
STEVENS CREEK FREEWAY
MATHILDA AVE
FAIR OAKS AVE
LAWRENCE EXPWY
237
MT VIEW-ALVISO RD
MONTAGUE EXPWY
OAKLAND RD
ALUM ROCK AVE
FOOTHILL EXPWY
280
STEVENS CREEK BLVD
SARATOGA-SUNNYVALE RD
SARATOGA AVE
SAN TOMAS EXPWY
DIVIDE AVE
CURTNER AVE
STEEL
WHITE RD
EXPWY
TULLY RD
SILVER CR RD
SAN FELIPE RD
CAPITOL
MONTEREY
HILL
BLOSSOM
SARATOGA-LOS GATOS RD
CAMDEN AVE
STA TERESA BLVD
SNELL AVE
SANTA CLARA COUNTY
SAN MATEO - SANTA CRUZ COUNTIES
0 1 2 5
(KILOMETERS)

APPENDIX B